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## **REGIONAL PATTERNS OF INDUSTRIAL SECTORS IN EU COUNTRIES 1980-1995**

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### **ABSTRACT:**

Industrial concentration in some regions of the European Union countries and in the central areas of the EU is analyzed during the period between 1980-1995. In this paper we differentiate those sectors showing a stronger tendency towards spatial concentration from those which follow a constant patterns and from those that show a tendency towards territorial spreading.

Real convergence and the stability in the Monetary Union are demanding the modification of the problems caused by the excessive concentration. We make an econometric model to quantify and analyze the competitiveness and industrial policy effects on the industrial growth patterns of the regions.

We study the above mentioned effects in the industrial sectors of intermediate, capital and consumer goods in the regions of EU countries.

## 1. INTRODUCTION

In this paper we analyze the real convergence of industry in the European Countries and Regions during the period 1980-95.

In the section 2, we study the "spreading degree" in the industrial sectors of intermediate (Q), capital (K) and consumer goods (C ) and in the total of manufacturing industries for the 12 member countries of the CEE. We analyze the concentration of the manufacturing industry (R3 sector in the classification at level R6) in every country at regional level, since it was not possible to get more disaggregated data (at level R9) in the Eurostat Statistics. Moreover the greater part of the comparisons is referred to the years 1985 and 1990 because of the lack of actualized data in Eurostat Regional Statistics.

In that section, we show that the industrial concentration has diminished in Europe in those cases in which the degree of concentration was higher, i. e., it can be noticed a small degree of convergence. Although this is an auspicious fact, it is unsatisfactory. In this sense, we think that it would be necessary a regional policy in order to give more support to the industrial development in the peripheral regions.

In section 3, we present an econometric model to explain the industrial value-added per head in 1990 for the European regions. In this model, we take into account demand and supply factors and other location factors such as education, culture, etc..

In section 4, we analyze the industrial aid policies in the EC countries and their influence in the industrial concentration and growth. We also point out some recommendations for the real convergence in Europe.

Finally in the section 5, we present some conclusions of this paper.

## 2.- SECTORIAL PRODUCTION IN EUROPEAN UNION INDUSTRY.

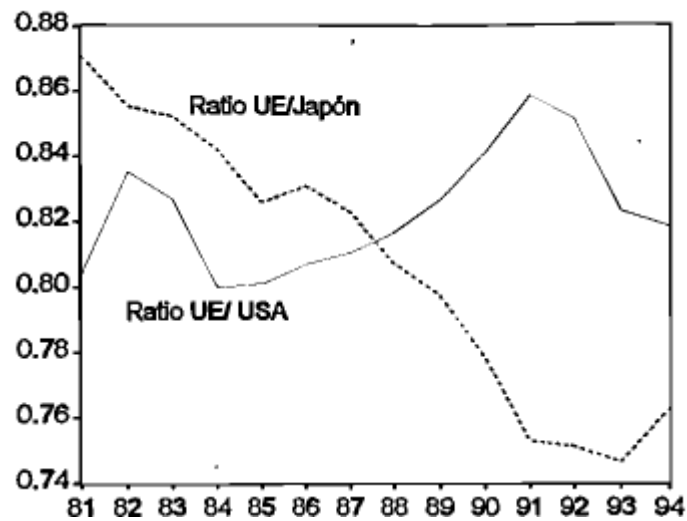
The first issue is to make a comparison between the European Union industry and those of US and Japan both in terms of value-added by employed person or "labour mean productivity" (PM) and in terms of valued-added by inhabitant (PH). This last variable is very important for the future of employment in Europe, as it is almost impossible to get a substantial increase of employment in the regions with high rates of unemployment if there is not a substained increase in industry.

If we make a comparison at RR9 Eurostat classification, we have 3 groups of manufacturing industries:

- 1) Sector Q, "intermediate goods", that includes Chemistry and extractive and basic metal industries.
- 2) Sector K, "capital goods", that includes Machinery and Transport Equipment.
- 3) Sector C, "consumption goods", that includes sectors from R8 to R11 in RR17 Eurostat classification: wood products, food, cloth and footwear, printing and press, etc.

In the period from 1981 to 1994, GDP per inhabitant in real terms (1990 US dollars), GDP90H, experienced in the European Union a low growth in comparison with those of USA and Japan. In this period, EU15 (with an average increase of 298 US dollars per year) is behind USA (with 341 US dollars per year) and considerably behing Japan (with 581 US dollars per year). Graph 1 shows the ratios of GDP90H of European Union to the same variable in USA and Japan. We can see the declining trend of the ratio UE/Japón and the oscillations in the UE/USA ratio, in which UE did not shows a tendency to reach the US level.

GRAPH 1. Ratio of GDP per capita



This is not accidental, but the consequence of different industrial policies. In the next tables, we show the PH and PM for each of the above mentioned industrial sectors and for the manufacturing sector (M), which is the sum of Q, K and C.

TABLE 1. Value-added per inhabitant in 1990  
(at the prices levels and exchange rates of 1990).

	PHQ	PHK	PHC	PHM
USA	997	1731	1402	4130
Japan	1530	3157	2090	6777
UE15	1208	1771	1450	4429

TABLE 2. Value-added per employed person in 1990.  
(at the prices levels and exchange rates of 1990).

	PMQ	PMK	PMC	PMM
USA	72729	53021	46566	54011
Japan	107818	54761	39478	54311
UE15	61634	44614	39379	46078

From the analysis of these data we can concluded that: 1) European productivity (PM) is lower than that of USA and Japan in the whole of manufacturing and in each of the three sectors. 2) In sectors K and C, value-added by inhabitant (PH) in EU is similar to USA and lower than in Japan. 3) In sector Q, UE has a higher PH that USA. 4) In the three areas, sector K has the highest sectorial value-added of industry.

There is a great relation between many non-manufacturing activities, as services and construction, and the increase in these industries, this has been show by Guisán(1995) by mean of an international econometric model with data from USA, Germany, Japan and Spain for the period 1970-92.

We also observed that USA creates more employments in services than the UE for a same level of manufacturing production. The amount of services produced in USA is higher since there are more people working than in Europe.

Europe needs in our opinion: 1) Increase manufacturing PM and PH, specially in regions and countries with very low values and high unemployment rates. 2) To increase the impact of manufacturing on services, in order to get rates of employment in services as high as those of USA and Japan. 3) These measures will decrease the high European rate of unemployment, and will give more opportunities to young people and to all the unemployed persons in Europe.

In relation with the concentration of industry in Europe, we have shown in other papers that Europe has less differences among social classes but more differences in regional groups than the USA.

European Treaty of Maastrich was designed with an idea of promoting a great mobility from the less developed regions to the richest ones. But this is in general a mistaken solution, there is a social trends to reduce the degree of mobility. In fact, next table shows that in period 1980-95 the distribution of European population did not change substancially among the 4 group of regions here considered and described in the Annex.

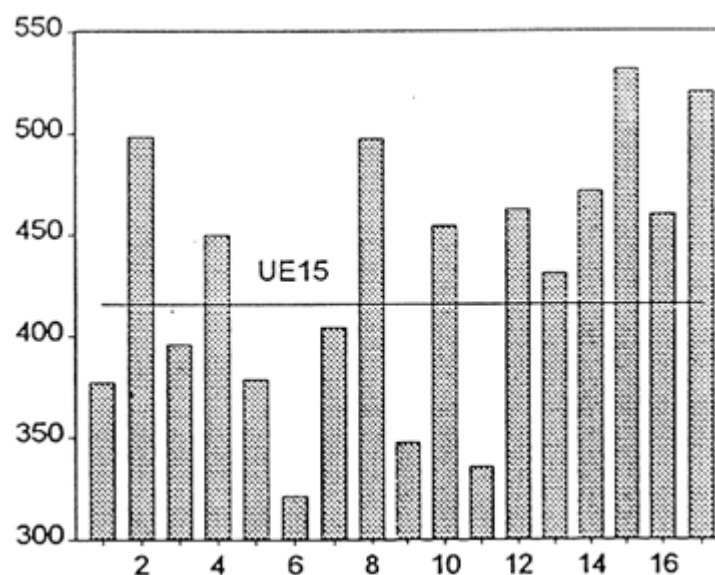
TABLE 3. Ratio of population (Region/EC12)

	1980	1990
Central Regions	40.69	40.52
Intermediate Regions	24.56	24.48
North Peripheral Regions	13.34	13.22
South Peripheral Regions	21.40	21.79

There is a imbalance between the distribution of employment and population in Europe, and there are important differences in employment rates both among countries and regions.

Graph 2 show the rates of employment, in 1990, in the 15 UE countries in comparison with USA, Japan and the UE15 average.

GRAPH 2. Employment per 1000 inhabitants in 1990



The numbers of the countries are the following:

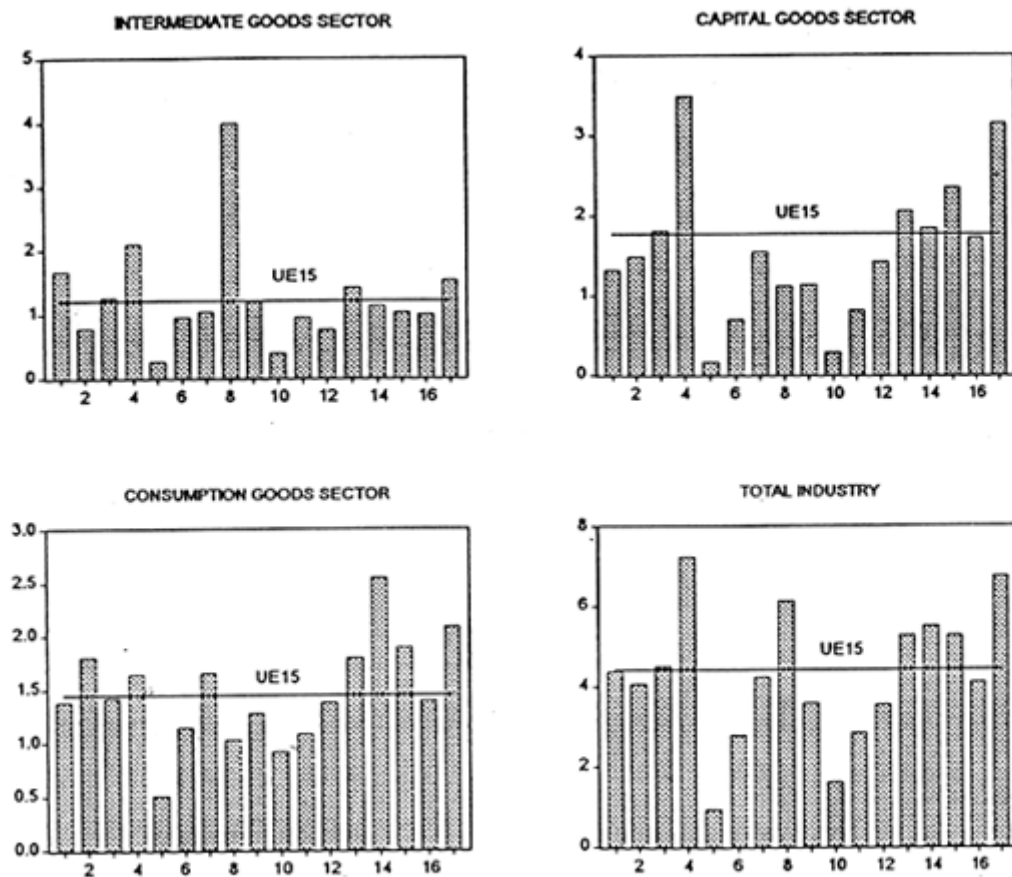
- |            |                |             |
|------------|----------------|-------------|
| 1. Belgium | 7. Italy       | 13. Austria |
| 2. Denmark | 8. Luxembourg  | 14. Finland |
| 3. France  | 9. Netherlands | 15. Sweden  |

- |            |                    |           |
|------------|--------------------|-----------|
| 4. Germany | 10. Portugal       | 16. USA   |
| 5. Greece  | 11. Spain          | 17. Japan |
| 6. Ireland | 12. United Kingdom |           |

The concentration of manufacturing has hardly changed either. The higher the variation coefficient of PH among countries, the greater the concentration. In this sense, sector Q has the highest concentration with a coefficient of 77.25% in 1990, followed by sector K, with a coefficient of 67.58%, and sector C which is the one with less geographical concentration and a coefficient of only 28.20%. In the manufacturing sector, as a whole, the coefficient of variation among countries was 46.05% in 1980, 49.81% in 1985, and 45.51% in 1990.

The following graphs show the great geographical differences of the 17 aforementioned countries, in manufacturing production by inhabitant. These graphs show that national and regional differences must be reduced, not lowering the manufacturing production in the regions where it is higher but designing a policy in order to obtain higher increases of the manufacturing production in the poorest regions.

GRAPH 3. Production per head in the industrial sectors  
(at prices level and dollar exchange rates of 1990)



In the next section we analyze regional location of industries.

### 3. THE ECONOMETRIC MODEL

In order to analyze the real convergence and the concentration of industry in Europe, we present an econometric model where we try to explain the Industrial GDP per head in 1990 (manufacturing) for 98 European regions (corresponding to the former EEC12).



The main variables used are:

VA390H = Industrial Real Value added per head of 1990, in dollars per head (at price level and exchange rate of 1990). Data sources are the Eurostat Statistical Yearbook of Regions (1994) and OCDE National Accounts, vol.I (1996).

VA385H = Industrial Real Value added per head of 1985, in 1990 US dollars per head (at price level and exchange rate of 1990). Data sources are the Eurostat Statistical Yearbook of Regions (1989) and OCDE National Accounts, vol.I (1996).

W390 = Industrial wage in 1990: average income of Industry workers, in thousand of dollars per worker (using the exchange rate of 1990). Data sources are the Eurostat Statistical Yearbook of Regions (1994). Data for Greece are not available.

IW3 = Index for Education and Research, Guisán and Frias (1996). Its construction is based in the following variables: % of active population with level of education more than or equal to second level of Secondary School complete; Number of students (all levels) / population; Expenditure per head on education (public and private) and Public Expenditure on Research and Development.

IWS = Index for Socio-Cultural standards, Guisán and Frias (1996). Based in IW3 index and the following variables: % of female participation in politics; % of female participation in management and % of female in labour income.

IWP = Index for Public Services and Infrastructure, Guisán and Frias (1996). Its construction is based in the following variables: Rate of employment in Public Services and the Inverse of the number of traffic deaths per 1000 inhab.

Several Dummy Variables have been defined so as to reflect the geographical situation and the level of Industrial Value Added per head in 1990 for the European regions. The Dummy variables included in the model are the following:

DCE = Dummy for the Central Regions

DIN = Dummy for the Intermediate Regions

DPN= Dummy for the North-Periphery Regions

DPS= Dummy for the South-Periphery Regions

For more information of these dummies see the Annex (at the end of the paper).

The equation relates the variable VA390H, at regional level, with the VA385H (to capture the effect of the industrial specialization of the regions), the average industrial wage in 1990 (W390) and the dummies to reflect the geographical location of the European Regions. We include location factors related with past specialization, geography, salary conditions and the level of education and research.

Our model is:

$$VA390H_i = b_0 + \quad + b_1 W390_i + b_2 VA385H_i + b_3 IW3_i + e_i$$

$i = 1, 2, \dots, 95$  regions

Due to the problems caused by the lack of Industrial Wages data for the Greek regions we have to remove these regions from the model.

First of all, we estimated the model considering 4 areas and 3 dummies, being  $b_0$  the intercept for DIN = 1, and  $b_0 + a_1$  ( $i = 2, 3, 4$ ) for the other 3 areas.

This estimation presented a very high degree of multicollinearity, which can be considerably reduced with a new definition of the dummy variables.

DP = DPS + DPN . Dummy for the Peripheral regions.

DCE = New dummy for the Central regions, where we excluded Denmark.

DIN = New dummy for the Intermediate regions, where we included Denmark.

Then we decide to estimate the model with  $p=3$ ,  $D2 = DP$  and  $D3 = DCE$ . As  $b_0$  represent the intercept for Intermediate regions, we expected to obtain a negative value for the coefficient of  $DP$  and a positive one for  $DCE$ .

Table 4 presents the results of the model estimation.

TABLE 4. Results of Estimation

LS // Dependent Variable is VA390H			
Sample: 1 98			
Included observations: 95			
Excluded observations: 3			
Variable	Coefficient	Std. Error	t-Statistic Prob.
C	787.6685	192.8772	4.083783 0.0001
DP	-253.0546	131.3021	-1.927270 0.0571
DCE	314.2842	134.0082	2.345262 0.0212
VA385H	0.964233	0.041046	23.49161 0.0000
W390	-25.82857	9.427139	-2.739811 0.0074
IW3	7.828504	4.275935	1.830829 0.0705
R-squared 0.949865 Mean dependent var 4039.317			
Adjusted R-squared 0.947048 S.D. dependent var 1931.839			
S.E. of regression 444.5401 Akaike info criterion 12.25516			
Sum squared resid 17587811 Schwarz criterion 12.41645			
Log likelihood -710.9190 F-statistic 337.2405			
Durbin-Watson stat 1.965388 Prob(F-statistic) 0.000000			

All the explanatory variables have a significative effect at 10% level, and three of them are significative even at a 2.5% level, showing a great relation with the dependent variable. The model presents a good fit.

The results displayed show a great positive influence of the 1985 Industrial Value added per head over that of 1990, reflecting the importance of the background in the industry.

This result stands out the importance of a consolidated industrial structure for the future industrial growth in the European Regions (the estimated coefficient corresponding to this variable is equal to 0.96).

Wage shows a negative influence on the 1990 Industrial Value added per head not so high as it is usually thought. In fact there are other factors that seem to have a bigger influence.

The Index for Education and Research, IW3, displays a positive and significative influence on the 1990 Industrial Value added per head. Its estimated coefficient is 7.83, and represents the importance of the influence of human capital on the growth of the industrial value added of the European Regions.

The coefficient corresponding to C, shows the estimated intercept of the Intermediate regions, defined above.

The influence of geographical location for the Peripheral regions, is collected by the sum of 787.6 and -253.0, which is equal to 534.6. This coefficient is lower than the intercept of the other two areas, which means that they have a disadvantage that needs to be compensated with an adequate policy.

The Central Regions are the privileged regions in the EC. These regions, with a value of its estimated intercept of 1101.8 (787.6 + 314.2), are the regions with bigger value of industrial value added per head, bigger index of education and research, and bigger wage mean.

Intermediate regions are in a situation of approximation to the central regions, but they need to improve their IW3 and other location advantages so as to increase their GDP growth rates in order to converge with the regions of the central area.

An alternative specification to the equation above could be including the variable IWP (Index for Public Services and Infraestructure). However, this variable causes multicolineality problems because of the high correlation between this variable and the variable IW3.

Other dummy variables could be included in this equation to differentiate special regions that, due to its own characteristics, present a growth of VA390H different from the rest, such as Ireland, North of Portugal and Franche-Comté. These regions have a high

Industrial Value added growth, but their situations are very different. Ireland and the North of Portugal are both peripheral regions (north and south, respectively) whereas Franche-Comté is a central region of Europe, where the level of Industrial value added per head is elevated.

The North of Portugal shows a large increment of Industrial Value added, which makes this region to stand out over the others in this respect (the ratio between VA390H and VA385H is 1.7 while the next region according to this ratio has a value of 1.5).

#### **4. POLICY OF AID TO INDUSTRY IN EUROPE**

In this section, we analyze the national and community aid to industry in the member states of the EC12. Data and comments are based in the periodical surveys on state aid published by the European Commission.

In Table 5, we present the evolution of state aid to industry, in percentage of Value Added, in the EC12 during the period 1986-94.

TABLE 5. Industrial Aid  
(% respect Value Added).

	1986-1988	1988-1990	1990-1992	1992-1994
Belgium	4,4	5	7,9	4,8
Denmark	2,0	2,3	1,9	2,8
Germany	2,7	2,6	3,5	4,8
Greece	15,5	16,9	12,5	10,5
Spain	5,3	3,7	2,1	1,7
France	3,7	3,7	2,7	3,3
Ireland	6,1	3,9	2,7	3,5
Italy	6,7	7,8	8,9	8,4
Luxembourg	2,3	3,4	3,5	2,9
Netherlands	3,3	3,2	2,5	2,1
Portugal	8,3	7,3	4,6	4,4
United Kingdom	2,7	1,9	1,4	0,8
EC-12	4,0	3,8	3,8	4

Source: "Comision de las Comunidades Europeas" 1991, 1995 and 1997

According to this Table, we can observe a general tendency towards the diminution in the most of the countries during the period 1988-1994. Exceptions are the cases of Germany (probably caused by the reunification), France, Ireland and Denmark, where there was a decreasing tendency until 1992 and a increasing trend after this year.

Greece and Italy are the countries that assign the highest percentage of their value added to industrial aid, high above Community average. On the contrary, the declining tendency in Spain, United Kingdom and The Netherlands positioned them in the last places in the period 1992-94, high below Community average. United Kingdom, followed by Spain, is during all the period (1988-94) the country that less resources assign to aid to industry.

In Table 6, we compare the amount of aid to industry in the 4 big economies (Germany, France, Italy and United Kingdom) with that amount in the 4 cohesion economies (Greece, Spain, Portugal and Ireland). We present the percentage that the aid to industry in these groups of countries represent over the total state aid to industry in the community.

TABLE 6. Distribution of Aid to Industry  
(in % over the total state aid to industry in the UE-12)

	1986-88	1988-1990	1990-1992	1992-1994
Biggest Economies	80	82	82	85
Cohesion economies	12,3	15	9,3	8,3

Source: "Comision de las Comunidades Europeas" 1991, 1995 and 1997

This Table shows that the amount of industrial aid in the 4 biggest economies was the 82% of the total of state aid to industry in EC in the period 1988-92, and the 85% in 1992-94, despite the fact that in United Kingdom it decreased during all these years and in Italy these aid decreased in the last period (1992-94). On the contrary, in the 4 cohesion countries this percentage fell from 15% (1988-90) to 9.3% (1990-92) and to 8.3% (1992-94).

These figures indicate that industries in biggest economies received more industrial aid than in the cohesion economies. Comparing these percentages with the percentage of population in 1990, we show that the biggest economies represented the 71.78% of UE-12 population and the 82% of the industrial aid. On the other hand, the cohesion economies represented the 18.91% of the UE-12 population and only the 9.3% of industrial aid (8.3% in the next period). This comparison shows that the cohesion economies do not seem to pay a suitable attention to their industry.

Table 7 presents the evolution of the statal aid, in percentage of their own Value Added, in the 4 big economies and the cohesion economies.

TABLE 7. Aid/Value Added in Industry

	1988-1990	1990-1992	1992-1994
Biggest economies	4	3,7	4,2
Cohesion economies	6	3,3	2,9

Source: "Comision de las Comunidades Europeas" 1991, 1995 and 1997

We show that the aid in the 4 big economies were 4% in 1988-90, 3.7% in 1990-92 and increased until 4.2% in 1992-94. On the other hand, in the cohesion countries decreased from 6% to 3.3% and to 2.9%.

Therefore, as the 5th survey on state aid points out "the relative importance of industrial support is rising in the more central Member States" and conclude that "this unbalanced situation does not contribute to economic convergence and demonstrates that there is room left for improving economic and social cohesion. In this context it should be noted that in addition to national State aid, industry also benefits from Community interventions via the Structural Funds. The effectiveness of these instruments, however, depends crucially on their not being outweighed by unbalanced development in the use of State aid measures in the Member States".

In relation with the types of aid instruments, we can distinguish: grants, tax exemptions, equity participations, soft loans, tax deferrals and guarantees. Direct grants are the instrument most frequently used in UE-12. These direct grants represented more than the 70% of aid to industry, in all the countries in the period 1990-94, with the exception of Belgium, Germany, Italy, France and Greece.

Tax exemptions are ranked second. Spain did not use this type of aid at all, and Luxembourg, Denmark and the United Kingdom used them in a small percentage.

From 1990-92 to 1992-94, we can observe a slight decrease in the percentage of direct grants and tax exemptions in favour of other instruments, especially soft loans.



In Table 8, we present the evolution of the state aid targeted to regional objectives (regions under art. 92.3.a and 92.3.c of the EC Treaty, and aid to Berlin and Zonenrand), in percentage of the industrial aid in each country.

TABLE 8. Regional objectives in industrial aid in each country.  
(% respect statal industrial aid)

	1986-1988	1988-1990	1990-1992	1992-1994
Belgium	21	21	9	15
Denmark	9	3	2	3
Gemany	60	64	81	80
Greece	39	25	29	21
Spain	3	5	12	16
France	9	9	17	18
Ireland	39	51	69	73
Italy	55	55	57	50
Luxembourg	56	60	70	70
Netherland	15	14	17	15
Portugal	5	5	10	26
United Kingdom	37	30	31	48
EC-12	39	39	50	53

Source: "Comision de las Comunidades Europeas" 1991, 1995 and 1997

In relation with the objectives, states aid to industry can be directed to horizontal, sectorial and regional objectives. We only explain the evolution of aid given to regional objectives because of their importance for the cohesion. Therefore, the rest of aid, that have not been displayed, are directed to horizontal and sectorial objectives.

Regional aid were the 39% of the total amount of state aid to industry in the EC in 1988-90, the 50% in 1990-92 and increased until the 53% in 1992-94. In general, the main part of these aid were destined to regions under art 92.3.a (Greece, Ireland, Portugal, east of Berlin and other east Germany regions, Galicia, Asturias, Cantabria, Castilla y León, Castilla-La Mancha, Extremadura, Comunidad Valenciana, Andalucía, Murcia, Canarias,

the French "Départements d'outre mer", Campania, South of Italy, Sicilia and Sardegna, and North of Ireland).

Germany, Ireland, Luxembourg and Italy destined over 50% of their total industrial aid to regional objectives in this period, showing a rising tendency, with the exception of Italy where this tendency changed in the last years (1992-94).

On the contrary, Denmark, Belgium, Spain and Portugal are the countries that destined less aid to regional objectives of their total aid to industry. It is important to emphasize that there is a growing tendency in Spain and Portugal, which is higher in Portugal. Spain continues to be one of the countries that less aid gives to regional objectives (in 1992-94). Besides, in Portugal, as the mentioned 5th survey points out, the main part of the horizontal aid is cofinanced by the Commission and "are more akin to the regional aid given in 92.3.a regions because the whole territory of Portugal, as with Ireland and Greece, is considered by the Commission as constituting a 92.3.a region".

The situation of Spain is peculiar, both for the low level of aid to industry and for the small percentage of this granted to regional objectives. Especially, taking into account that a large part of its territory is under the objective nº 1 and that is one of the countries with higher level of unemployment.

However, we have to be careful in analysing the figures related to the objectives since it is difficult to distinguish the main objective among the several objectives that are set by every state.

In general, the regional policys of the Member States during the last decade have been aimed to restructurate their regional production systems. As an study published by the Commision in 1993 explains, the regional financial incentives follows to be the main instrument to foment new productive investments in regions but the political authorities are less confident in grants as mean to attract investments and to create employment, and therefore the measures implemented by them are more aim at improving the competitiveness and the regional business environment.

This new policy orientation has been carried out in a phase with budgetary restrictions and for that reason the concession of aid is now more discretionary and less automatic in order to direct these aid to sectors or projects where more effectiveness can be obtained.

The comments presented in this section seem to indicate that the aid to industry in Member States are not diminishing the disparities between regions, in particular, between the regions of the big economies and the cohesion economies. But we also have to take into account the Structural Funds.

However, it is difficult to make a comparison between these Funds and the state aid to industry, because of the horizontal nature of some Funds. The Funds represented a significative part of the resources in the 4 cohesion countries: the 60.7% of the total aid in Portugal, the 48.7% in Spain, the 43.1% in Ireland and the 36.4% in Greece, in the period 1992-94. On the contrary, they only represented the 17.8% in the EC-12.

However, the main part of these Funds is destined to improve the infrastructures instead of improving the investment in production activities, especially in Spain.

The analysis above and the results of our econometric model show that it is necessary to implement measures of Industrial Policy in order to correct the comparative disadvantages of peripheral regions. These measures have to include, among others, the following actions:

1. To increase the IW3 indicator, i . e., to improve education and research especially in the regions where it is lower.
2. To increase aid to improve road and rail connections to reduce the distance among regions, especially in the peripheral regions.
3. To lower the industrial site price, to increase the tax exemptions and other direct and to implement indirect aid in order to make peripheral regions more attractive and profitable.

These measures, as it is pointed out in IGLESIAS, FRIAS and VAZQUEZ (1997), would have an important impact on the non-agrarian employment growth in Europe.

## 5. CONCLUSIONS

We have analyzed several topics related to industrial locations at regional level in the European Union. We have used data from the 98 regions of 12 countries to fit a cross-sectional model that takes into account several factors that explain industrial manufacturing, including all the non-energy branches.

We have also analyzed industrial and regional policy both at EU and country level in order to explain the lack of real convergence and the problems that arise from this as the increase of unemployment in Europe.

We have also made some comparisons among UE, Japan and USA in relation with labour productivity in industrial sectors, production per inhabitant and rates of employment in non-agrarian sectors. From these comparisons, we point out the Europe needs to increase the rate of employment in non-agrarian sectors to keep the step with the other industrialised countries. In this connexion regional industrial policy is essential.

From these analysis we draw the following conclusions:

1) In the period 1981-1994, the ratio of UE-15 GDP per head to Japan GDP per head in real terms declined from 87% in 1981 to 82% in 1994. This was mainly due to the positive effects that more industrial growth provoked in the services sectors in Japan. Comparising UE and Japan industries, the greater levels of value-added by head of Japan in the three groups of industries analyzed: intermediate goods(Q), capital goods (K), and consumption goods (C). Stands out of this groups the ratio of UE15 to Japan in 1990 was 0.65, and the differences in the rates of non-agrarian employment are much favourable to Japan as a whole.

2) In comparison with USA, the ratio of GDP per head has had in the period 1981-94 an oscillatory evolution, around 82%. In this case, the differences in industrial production per

head are negligible in sector K and C, and favourable to UE15 in sector Q. In the whole of these groups we can observe a very similar level of industry. Nevertheless there is not only a lower GDP per head in Europe, but also a lower rate of employment in services. The reason of this is that USA has a fiscal and law system more favourable to increase demand and supply of services for a same level of industrialization.

3) As the UE challenges for next years, besides of reducing bureaucratic difficulties to enterprises and social initiatives, are mainly related with the reduction of unemployment, and with the increment of GDP per head in all their regions, specially in the poorest, we reckon that industrial regional policy needs a new approach. In this paper, we have shown that the location factors of industries are extremelly related with three features of regions: geographical situation, background of lagged value, and the index of education and research. These factors show a positive and significant effect in our econometric model of 98 regions of UE, which is more important that the differences in wages.

4) The positive factors of industrial location are generally higher in the regions situated geographically in central an intermediate areas and lower in the periphery, specially in the Southern periphery. These findings mean that we need a regional "convergence-promoting" policy based in reducing the disadvantages of these regions and making profitable to set up industries in many of them, specially those industries which create more employments.

5) The differences in industrial GDP per head are enormous among European regions and, in general, they are not being reduced. However, the implementation of different policies in a few regions shows that special actions can help, for instance, the reduction of land prices for industries in the North of Portugal. At the end, the more we increase the level of industrialization in regions with low rates of employment in non-agrarian sectors, the better will be for the whole of UE, increasing employment and GDP per head in all the countries.

6) We encourage the inclusion in the Regional Industrial Policy measures of tax exemptions, low prices of industrial sites, improve transport infrastructure, adequate and flexible legal framework and also more help on education and research. It is very important

that this research is devoted not only to the technological field but also to other fields, especially socio-economic and law.

## ANNEX

### Definition of the dummy of location included in the model (Section 3)

DCE = Dummy for the Central Regions: 18 (Denmark), 19 (Piemonte), 20 (Vall d'Aosta), 22 (Lombardia), 23 (Trentino Alto-Adige), 24 (Veneto), 25 (Friuli-Venezia Giulia), 26 (Emilia Romagna), 27 (Toscana), 40 (Hamburg), 42 (Bremen), 43 (Nordrhein-Westfalen), 44 (Hessen), 45 (Rheinland-Pfalz), 46 (Baden-Wuttenberg), 47 (Bayern), 48 (Saarland), 49 (Berlín), 50 (Vlaams Gewest), 51 (Region Wallonne), 52 (Bruxeles), 56 (Zuid-Nederland), 57 (Luxembourg), 77 (Ille de France), 78 (Champagne-Ardene), 79 (Picardie), 80 (Haute-Normandie), 81 (Centre), 82 (Basse-Normandie), 83 (Bourgogne), 84 (Nord-Pais de Calais), 85 (Lorraine), 86 (Alsace), 87 (Franche-Comté), and 94 (Rhone Alpes).

DIN = Dummy for the Intermediate Regions: 4 (País Vasco), 5 (Navarra), 7 (Aragón), 12 (Cataluña), 13 (Comunidad Valenciana), 21 (Liguria), 28 (Umbria), 29 (Marche), 39 (Schleswig-Holstein), 41 (Niedersachsen), 53 (Noord-Nederland), 54 (Oost-Nederland), 55 (West-Nederland), 61 (East Midlands), 62 (East Anglia), 65 (West Midlands), 66 (North West UK), 89 (Bretagne), 90 (Poitou-Charentes), 91 (Aquitaine), 92 (Midi-Pyrenees), 93 (Limousin), 95 (Auvergne), 96 (Languedoc-Roussillon) and 97 (Provence-Alpes-Côte d'Azur).

DPN= Dummy for the North-Periphery Regions: 58 (Ireland), 59 (North UK), 60 (Yorkshire and Humbers), 63 (South East UK), 64 (South West UK), 67 (Wales), 68 (Scotland) and 69 (Northern Ireland).

DPS= Dummy for the South-Periphery Regions: 1 (Galicia), 2 (Asturias), 3 (Cantabria), 6 (La Rioja), 8 (Madrid), 9 (Castilla y León), 10 (Castilla-La Mancha), 11 (Extremadura), 14 (Balears), 15 (Andalucia), 16 (Murcia), 17 (Canarias), 30 (Lazio), 31 (Campania), 32 (Abruzzo), 33 (Molisse), 34 (Puglia), 35 (Basilicata), 36 (Calabria), 37 (Sicilia), 38

(Sardegna), 70 (Norte Portugal), 71 (Centro Portugal), 72 (Lisboa e Vale do Tejo), 73 (Alentejo e Algarve), 74 (Voreia Ellada), 75 (Kentriki Ellada) and 76 (Anatolika Kai Notia Nisia).

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